Mapping Recovery: A Qualitative Node Map Approach to Understanding Factors Proximal to Relapse Among Adolescents in Recovery

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ABSTRACT

Despite data suggesting that current substance use disorder treatments are largely effective in reducing substance use, most adolescents in SUD treatment experience relapse after finishing treatment. Understanding the factors proximal to relapse is crucial to understanding the course of substance use disorder and how best to improve recovery among adolescents. The current study represents part of a novel line of research using qualitative data analysis to examine these factors. Data for the present study were 200 de-identified node-maps, completed by high school students at Hope Academy, a recovery high school in Indianapolis, Indiana. The reported age in this sample ranged from 14-20 years (64.1% male, 89.1% White), with a mean age of 16.8 years (SD = 1.9 years). After a four-phase process of qualitative data sorting, primary people, places, and things most frequently described included using with others (n=153, 76.5%), away from home (n=156, 78.0%), and in response to negative affect (n=93, 48.4%). Eleven relapse pathways emerged: escaping (n=16), self-medicating (n=3), coping with tragedy (n=5), critical mass (n=6), unexpected activation (n=8), unexpected offer (n=22), planned use (n=19), resistant to recovery (n=5), not in recovery (n=22), passive agency (n=30), and acting out (n=15). Recovery is a system made up of many interrelated parts, including those related to the individual person in recovery, their thoughts, beliefs, feelings, and emotions; and those related to external factors, their environment, adverse life events, and the actions of other people. By considering the pathways together for their common features, they can each be said to represent one of three critical failures related to those three overarching facets of the system: failure to cope, failure to guard against temptation, and failure of belief. Identifying these overarching failures in the system is helpful because the failures contain in themselves the seeds of their solution, so by examining them as critical components to a relapse event, it may be possible to gain insight into how to prevent the same type of relapses from occurring in the future.

INTRODUCTION

Substance use disorder (SUD) is prevalent among adolescents: in 2017 alone, approximately 20.7 million people over the age of 12 met criteria for an SUD and/or had been treated for SUD in the past year: This translates to approximately 1 out of every 13 people in the United States (Substance Abuse and Mental Health Services Administration, 2018). Presence of an SUD during adolescence negatively impacts psychosocial development and brain maturation (National Institute on Drug Abuse, 2014). Despite data suggesting that current SUD treatments are largely effective in reducing substance use (Thomas & Deas, 2001; Waldron & Turner, 2008), most adolescents in SUD treatment experience relapse after finishing treatment (e.g., Godley et al., 2014). Thus, substance use relapse during or after SUD treatment is the norm, rather than the exception; understanding the factors proximal to relapse is crucial to understanding the course of SUD and how best to improve recovery among adolescents. The overarching goal of the current project was to examine proximal factors related to substance use relapse among adolescents in recovery from SUD.

The term "recovery" is often used in SUD treatment to describe the process of behavior and lifestyle change that a person undergoes in order to overcome SUD. Recovery has been defined as "a voluntarily maintained lifestyle characterized by sobriety, personal health, and citizenship" (The Betty Ford Institute Consensus Panel, 2007). For the purposes of this investigation, substance use "relapse" is defined as any instance of substance use following treatment initiation. Although the term "relapse" carries a negative connotation, it is nevertheless used in this manuscript for the sake of clarity, given that it is the most common term used in both the extant literature and among people in recovery to describe their re-initiation of substance use following treatment. The majority (60-70%) of adolescents relapse within 90 days of treatment cessation (Godley et al., 2014) and 47% of students resuming traditional high school following inpatient care return to their previous pattern of substance use within one year (Winters, Stinchfield, Opland, Weller, & Latimer, 2000). This has led some to suggest that treatment for SUD should incorporate a system of recovery emphasizing not only abstinence from substance use, but also the restoration of quality of life that has been damaged by SUD (Laudet & Humphreys, 2013). Reducing rates of relapse is an important goal to improve SUD recovery, but research has not yet determined the best method by which to do this.

A number of proximal factors have been identified for substance use relapse. In a study of adolescent substance use by Cornelius and colleagues (2003), the most common reasons given for a relapse were social pressure, physiological withdrawal, and negative affect. Social and environmental influences make up the strongest predictor of substance use relapse among adolescents (Anderson, Ramo, Schulte, Cummins, & Brown, 2008; Ciesla, Valle, & Spear, 2008; Gangi & Darling, 2012; Ramo & Brown, 2008). Specifically, involvement with peers who engage in substance use contributes substantial risk for those in recovery (Ciesla et al., 2008), while those who associate with new friends after receiving treatment reduce the probability of re-initiating regular use in half (Ciesla, 2010). Further, quality of social support during the recovery process is significantly related to risk of internalizing/externalizing disorders, involvement in criminal behavior apart from drug possession, likelihood to report victimization, and likelihood to engage in acts of physical violence (Godley, Kahn, Dennis, Godley, & Funk, 2005). According to the model laid out by Ramo and colleagues (Ramo, Prince, Roesch, & Brown, 2012), high-risk social situations coupled with lack of coping skills, low self-efficacy, and positive use expectancies all contribute to an initial "lapse" in sobriety, which then produces additional vulnerability towards continued use.

Mood and affect are also prime predictors. In adult samples, prominent factors include life stressors (including both interpersonal and intrapersonal conflict; Anderson, Frissell, & Brown, 2007; Kristen, Danielle, & Sandra, 2006), cognitive factors, social pressure (Gonzales, Anglin, Beattie, Ong, & Glik, 2012), and depressed mood and irritability/anxiety (McCarthy, Marlatt, Tomlinson, Anderson, & Brown, 2005), although the impact of negative emotions is moderated by individual differences in coping skills (Kristen et al., 2006) and self-efficacy (Ramo, Anderson, Tate, & Brown, 2005). Depressive symptomology predicts relapse among youths following treatment (Waldron, Turner, & Ozechowski, 2005). While adolescents also report negative mood as a precursor to relapse (Anderson, Frissell, et al., 2007), teens are more likely than adults to relapse in response to positive emotional states, such as those experienced during social events (Ramo & Brown, 2008; Ramo et al., 2012). Starks and colleagues (Starks, Golub, Kelly, & Parsons, 2010) lay out a broad array of affective pathways towards substance use, notable among these being a "pleasure driven" group, which is characterized by substance use primarily motivated by pleasant feelings and pleasant experiences with others. This pathway

towards use is particularly resistant to intervention, as the substance use itself is intricately tied up in other rewarding activities, such as socializing with friends and family.

Performance in school has also been shown to be an important factor in predicting success or failure in SUD recovery (Finch & Karakos, 2014), and schools supply programs and extra-curricular activities that provide alternative forms of reward necessary to lasting recovery (Moos, 2007). However, high school presents an environment of particular risk for adolescents in recovery, including risk for substance use relapse (Finch, Moberg, & Krupp, 2014). One emerging model for the treatment of adolescent SUD is the "recovery high school" or "sober school," which was developed as a collaboration among schools, parents, and treatment professionals as an education option for adolescents who have self-identified themselves as "in recovery" from SUD (Bowermaster, 2008). Although recovery high schools are relatively recent, the concept of providing confidential recovery services within the education program has a long history, often traced back to Brown University, with their appointment of an Associate Dean with Special Responsibilities in the Area of Chemical Dependency in 1977 (Finch & Karakos, 2014). Recovery schools are designed to provide a closed, nurturing environment where students can find the education, reinforcement, and peer support they need during a vulnerable time in the recovery process, while being insulated from the stigma and negative influences common to school settings (Moberg & Finch, 2008). As of 2014, there were over 100 programs for adolescent recovery across the country and these have filled a critical gap in the education system (Bowermaster, 2008; Finch & Karakos, 2014; Finch, Tanner-Smith, Hennessy, & Moberg, 2018).

In their day-to-day functioning, recovery high schools look and operate much the same as traditional high schools. Class curricula are similar and follow the same established milestones for learning that are common in most schools. They are distinct in that aspects of therapy for SUD, primarily focusing on principles of continued care and support, are blended in with academics, and students in recovery programs are expected to engage with this material, as well as participating in other aspects of recovery, such as peer-support groups and prosocial activities around the community (Association of Recovery Schools, 2016; Moberg & Finch, 2008). Recovery high schools enroll a relatively small number of students, although there is a great deal of variability between programs: A representative sample of programs surveyed in 2008 reported a typical range of 12-25 students (Moberg & Finch, 2008), but more recent studies suggest

enrollment to be between 2-115, with a mean enrollment to be between 24.5 and 32 (Finch et al., 2014; Association of Recovery Schools, 2016). Because they are nevertheless characterized by lower enrollment numbers, most recovery schools in the United States are embedded within other high school programs, both physically (i.e., shared facilities) and organizationally (i.e., shared faculty and staff); however, in every case, students in recovery are kept isolated to their own homogenous group (Association of Recovery Schools, 2016; Finch et al., 2014; Moberg & Finch, 2008). Although the number of faculty and staff varies based on whether the program is embedded or independent, most recovery schools have fewer teachers and school counselors than their counterparts, and the student-to-teacher ratio is reasonably maintained (Association of Recovery Schools, 2016; Finch et al., 2014). Recovery programs do not usually collect tuition, so their funding is eclectic and presents a frequent challenge to continued operation. Operating costs are most commonly supported through public education funding, federal grants, private donations, and/or financial partnerships, with the majority of these funds limited to correspond with per-pupil enrollment figures (Finch et al., 2014).

There is promising early evidence in support of the recovery high school program model. One recent study of high school students with SUD used a quasi-experimental design to compare students enrolled in a recovery high school program to a propensity-score-balanced sample of students attending traditional high schools (Finch et al., 2018). This study found that students attending recovery schools reported significantly less cannabis use, were more likely to report total abstinence from substance use (including alcohol) at a 6-month follow-up and were significantly less likely to be absent from school. However, empirical data from comparative studies regarding student outcomes in recovery high schools and the degree of overall contribution that such programs make to successful SUD recovery are in short supply. There are a number of reasons for this dearth of outcome data: First, a reliable set of standards for what sort of programs qualify as recovery high schools, how the programs themselves ought to be structured, what criteria need to be considered in evaluating such programs, and what language is used in the relevant literature has only recently emerged (Association of Recovery Schools, 2016). Such poor concordance makes data from past surveys difficult to evaluate in combination. Second, it is common for recovery high schools to see large student turnover, even within a single term, due in part to the fact that, as students' progress in their recovery and become more confident in their ability to maintain abstinence, they are more likely to feel that the program is

no longer necessary and to then rematriculate into their previous school system (Association of Recovery Schools, 2016; Finch et al., 2014). Although these departures are an intrinsic part of the recovery school model and are considered a natural consequence of successful education, variations in the sample and a loss of follow-up data are frequent obstacles to quantitative analysis of any given program. Finally, the voluntary self-selecting nature of both education and SUD treatment programs make experimental design impossible in outcome studies. Because any sample taken of students enrolled in a recovery school will be homogenous by nature of the program itself, no clear control or comparison group exists. It is difficult, therefore, to quantify any impact the program might have on student recovery over and above other factors exerting influence.

In summary, adolescent SUD is a significant and important problem, characterized by high prevalence rates, poor outcomes, and frequent relapse into old patterns of use. Prime factors related to these relapses among youth include social environment and affect. The recovery high school model is an emerging strategy to reduce substance use relapse and to improve recovery for adolescents with SUD; however, students in recovery high schools still experience relapse. The overarching goal of the current project is to examine proximal factors related to substance use relapse among adolescents enrolled at Hope Academy, a local recovery high school in Indianapolis, IN. This project is built on previous work done at Hope Academy by Zielke and colleagues (N.D.), which sought to characterize relapse episodes by a set of common emergent "pathways" to substance use and employs a similar methodological approach.

For students enrolled in Hope Academy, relapse episodes are common and considered part of the recovery process. When a student experiences relapse, he or she is asked to self-report this use. Because regular urine drug screenings are conducted, a relapse would be detected even if a student does not self-report, but the goal of the program is to encourage students to do so anyway. When a relapse is reported, the counselor and student complete what they refer to as an "unpacking," which is a visual node map depicting the relapse episode in terms of environmental, cognitive, and emotional factors that preceded and followed the substance use (for an example, see Appendix A). This process is similar to the behavioral-chain analysis exercise common to Cognitive Behavior Therapy (Beck, 2011) and is done within the existing therapeutic relationship, making it an opportunity to engage in a therapeutic process of understanding the proximal factors related to the relapse in order to move forward in treatment.

Fortuitously, this strategy makes it possible to study proximal factors related to substance use relapse among adolescents while also reducing retrospective and reporting biases and removing barriers associated with conducting research in this vulnerable but high-risk group. To date, Hope Academy has over 600 de-identified node maps from previous students; a random sample of 200 were used in the current study to identify specific "pathways" to relapse distinguished by patterns of thoughts, feelings, and behaviors that function as proximal factors to substance use relapse among adolescents enrolled in this recovery high school. The theoretical framework of this approach is based on that laid out by Zielke and colleagues (N.D.) in a previous study within this same population, informed by principles of "root cause analysis." The theory of root cause analysis is an approach used to study adverse events, such as completed suicide or patient elopement, which "presumes that adverse events are more often a result of system vulnerabilities, rather than the failure of an individual" (Riblet et al., 2017). Following this reasoning, the node maps will be qualitatively coded to identify common proximal factors to their core "adverse event," which in this case is an instance of substance use relapse, in order to identify specific pathways to relapse that, as proposed by Zielke et al. (N.D.), may serve to provide additional insight into how and why these episodes occur.

The current study is part of a novel program of research that seeks to fully characterize the factors proximal to substance use relapse among adolescents with SUD. The long-term goal of this research is to use this information to design and test strategies to reduce relapse rates among adolescents with SUD, thus improving outcomes and quality of life among this vulnerable and high-risk group. Such approaches could be applied to individual level determinants or to the improvement of recovery high school systems-level approaches. The primary aim of the present study was exploratory: I aimed to establish a better understanding of the inter- and intra-personal factors proximal to a relapse episode and identify distinct pathways to use in the sample. Although I had a number of expectations of key proximal factors based on previous findings in the literature (particularly pertaining to social and affective factors), my analyses constituted a primarily qualitative, data-driven approach, as recommended by Miles and colleagues (Miles, Huberman, & Saldana, 2014), and similar to that used by Zielke and colleagues (N.D.) in a previous study within this population. I did not, therefore, propose any specific hypotheses *a priori.*

METHODS

Data for this study were 200 de-identified node maps completed by high school students at Hope Academy in Indianapolis, IN. All of the node maps were de-identified before the random sample was selected for the current analysis. Because all data were de-identified, the project was deemed exempt by the Indiana University Institutional Review Board.

Node maps

When a student at Hope Academy reports a substance use relapse, they work with a trained clinical specialist to create a graphical node map breakdown of the event (see Appendix A). The goal of this process is to systematically record the student's recollection of how, where, when, and why the relapse event took place. The following procedure is used, as described in (Zielke et al., n.d.): First, demographic and descriptive information about the student is recorded; then, the specialist works with the student to construct a map of events by asking "What happened"; "Then, what happened?"; and so on until a complete chain of events encompassing the instance of use is recorded in black ink. Next, each step of the chain is examined with the question, "What were you thinking here?" and the student's thoughts are recorded next to each point in the node map in blue ink. Next, each step is examined with the question, "What were you feeling here?" and the student's feelings are recorded in green ink. Finally, the student is invited to consider the event as a whole and their overall responses or reflections are recorded on the node map in red ink.

Data Coding Process

The node maps generated by the unpacking process were examined using a multi-stage process of qualitative analysis, based on a system (Zielke et al., n.d.) for identifying emergent "pathways" to substance use, which employed the following methods: (1) forced coding of data found in the maps into categories based on low-inference descriptors, (2) systematic observation of the node map content in order to discover salient features, (3) documentation through written memos of salient emergent features in each map, (4) constant comparison both within and across node maps of these emergent features in order to generate data to be used in hierarchical

categorization of findings, (5) analysis of content within and between coded categories, and (6) content analysis to back-reference the coded categories and finally-proposed "pathways" fit with both objective criteria and pre-existing theoretical knowledge.

The study was designed to carry out the above methods in several phases, though by necessity these phases were not linear. Each stage of the coding process both added to and altered the existing coding scheme, and so the stages themselves are interdependent and reciprocal. For the sake of simplicity, the process of qualitative analysis is here separated into categorical phases.

Phase 1: Forced Coding

Descriptors. This part was carried out by trained research assistants and involved recording the most objective descriptive criteria from each of the node maps into numeric codes. This stage in the coding was designed to involve the least amount of required inference. Supervision and review at this point was done by the primary investigator solely for the purpose of clarity, consistency, and accuracy with regards to the existing codebook (Appendix B) and not yet in order to reconcile the disparate data produced by the heterogeneity of the node maps themselves. In other words, once the research assistants had demonstrated their ability to record data from the maps into their spreadsheets in the prescribed manner, they were allowed to complete the entire process independently. In this phase, the research assistants only observed and recorded the data prescribed by the first section of the codebook (see Appendix B), while all the rest of the node map was not considered. Missing data were recorded in the sheet, and any piece of data which did not fit exactly into the available categorizations provided by the codebook were noted in a separate spreadsheet. At this stage, those pieces of information were recorded verbatim as they appeared in the node map, and so not recorded as a numeric code. For example, several of the node maps included reported use of "pills." Since "pills" does not fit exactly into any of the categories for Substance Used in the codebook, those maps were coded as "10: Other/poly" and the specifier "pills" was recorded in an adjacent cell.

Once this initial stage was complete, the primary investigator incorporated all of the coded data from the research assistants' individual spreadsheets into a master codebook spreadsheet. At this point, the anomalous data entries mentioned above were fitted into the existing coding structure by the primary investigator.

Initial data cleaning: The first stage of data cleaning and reduction was performed on the coded data recorded in spreadsheets by the research assistants and was meant to (1) reconcile the varying codes into one central master spreadsheet, (2) transform and reduce the resultant data into a useful and easy to understand format, and (3) organize the transformed data into a form best suited for later analysis. In pursuit of these aims, the following steps were accomplished: (1) Seven node maps were deleted from the database and discounted from any further analysis; three because they were exact copies of other node maps included in the sample; two because the student refused the unpacking process and so no data were recorded; one because the account recorded in the unpacking was so fragmented and non-linear in nature that it could not reasonably be considered in conjunction with any other; and one because the narrative recorded was regarding an interpersonal issue and had no relation to substance use at all. Next, some other disparities in node map study IDs were corrected: since the data included no map numbered 137, and two maps numbered 143, 143a in the binder became n0143, while 143b became n0137. Eight node maps were identified as unusual inasmuch as they either involved acceptable substance use or proximity to substance use but no actual use; these were recoded as "9000" study ID numbers to separate them from the rest.

Next, a certain number of variables were deleted from the codebook since the coding process itself had revealed them to be either unnecessary or impractical. For instance, the "Hispanic" variable was deleted, since no positive identifiers were recorded in the sample. Finally, string variables were recoded into either binary or numeric-category variables in order to simplify later analysis. This process also allowed for vague data to be categorized into general terms without wrecking the consistency of the dataset as a whole. The "Sponsor" variable, for instance, meant to record the actual number of sponsor contacts per week, was problematic inasmuch as many of the node maps only recorded vague information about such contacts (e.g., "sometimes call") rather than an exact number. This variable was therefore recoded into a 3-category variable, with all node maps coded as either 0-no sponsor, 1-no contacts with sponsor, or 2-contacts sponsor. In this manner, all node maps could be coded for this variable, thus eliminating missing data, and also the key factor of interest (whether or not they were contacting a sponsor) could still be meaningfully captured. For a full record of data management, see Appendix C.

Affect and feelings. At the same time that the primary investigator was cleaning the initial codes, the research assistants embarked on the second round of coding in which the focus now became coding of affect and feelings. During this process, each of the "feeling" nodes recorded in the node map (in green) were recorded on a separate sheet with the exact statement made in the node map recorded on the far-left column. Next to each of these, the primary feeling was identified by extracting the core word from the statement made. For instance, in the node "Happy going to get high again," the core emotion expression extracted was "happy." This core emotion word was recorded in the column next to each statement, and then scored for valence and arousal, based on previously established scoring criteria. Once this process had been accomplished for each of the terms in the node map, then total valence and arousal scores were calculated for that map and recorded in the coding spreadsheet. Finally, based on the total valence score, each of these maps would then be scored as either positive, negative, or mixed, with regards to the overall affectivity which they exhibited. During this phase of the coding process, all maps were coded by both research assistants.

Thoughts and cognition. Once the above portion of coding had been completed, the final stage of descriptive-level coding was performed by the two research assistants with only occasional supervision in the form of randomly selected double-coding on the part of the primary investigator to ensure accuracy and consistency of the coding process. During this period, the thoughts (in blue) from the node maps were transcribed into sheets similar to those used in the previous process for recording feelings. Again, the exact words used in the node map were recorded in the far-left column of the codebook, while in the two columns next to this, the research assistants were asked to flag any occurrence of (1) cognitive distortions, or (2) remarkable thought patterns. "Cognitive distortions" were categorized based on the common specifying criteria readily available in standard CBT, and included such examples as discounting the positive, "should" thoughts, and catastrophizing. Research assistants were trained on the meaning and characteristics of each of these and provided with a reference sheet to help their identification during the coding process.

Review and reconciliation. The stage of review and reconciliation of data produced independently by the two research assistants was done by the primary investigator. All data were examined and incorporated into the master SPSS spreadsheet, and any inconsistencies or peculiarities were examined and resolved by the primary investigator. At this stage also, all of

the descriptive data generated in the above stages were cleaned and reduced in preparation for further analysis. This cleaning process itself revealed a wide range of differences between the node maps, and these were resolved during the reduction process in the following manner:

The quantitative (numeric) scores for affect were eliminated from the dataset. Upon thorough examination, it was evident that the coding procedures had not captured the essential quality of the data in the manner intended. Specifically, since the students used a wide variety of language in describing their thoughts/feelings, often in terms that violated the defined quality of these categories (for example, reporting "felt guilty" as a thought); recording their actual stated feelings produced a number of terms irrelevant to actual feelings (e.g., "not sure what to do"). As a result, the attempt to create meaningful valence and/or arousal scores off of these was sullied, and so much of the data became unusable. This being the case, further analysis would have necessitated interpretation of the statements made by these students into meaningful and useful emotional terms but doing so in order to produce a quantitative score seemed like such a great extension away from the actual data itself as to become functionally useless. As a result, those scores were abandoned, and emotions/feelings were included in the analyses from a qualitative standpoint only.

During this process also, missing or unclear data that had been recorded as string variables only were rectified into the coding process. For instance, many of the substances used were reorganized into different categories based on the drug class of the substance (Mucinex D, for instance, was removed from the Opioid category and put into its own newly created category for over-the-counter drugs). Drug categories were also reduced based on the data itself: "stimulants" for instance, was recoded as "cocaine," since nearly all recorded cases were of cocaine use; while "club drugs" was recoded as "amphetamines" since the only instance recorded was of MDMA, which was judged to be more meaningfully coded as an amphetamine. Additionally, many node maps reported multiple points of data for each variable—using with multiple people, different locations, and using different substances, for instance—which made coding them into single variables difficult. Additional variables were created therefore for each of these separate options within larger categories of interest (the "substance used" variable, for instance, was replaced with a series of "SU_1," "SU_2" etc. variables, each representing a binary code for the use of that particular substance). In this manner, multiple codes could be recorded and considered for each variable for each node map. Other categories of variables were

combined, deleted, or created for ease of use and many string variables were recoded into one or more numeric variables for the purpose of further analysis. For a full report of this process, see Appendix C.

Phase 2: Qualitative Discovery

The second phase of data coding overlapped with the final cleaning and reduction stage described above and involved the primary investigator reading through each of the node maps and making note of any emergent features that seemed particularly salient in order to qualitatively identify each map. This first stage of qualitative sorting was the vaguest and involved primarily recording (1) quotes from the maps that indicated some significant piece of data about the reporting student (e.g., "If something comes to mind, I do it"), (2) brief summary identifiers of salient feature in the unfolding narrative of the relapse itself, (e.g., *Called old using friend, No plans, Went to Broad Ripple*), or (3) noteworthy descriptors about the situation or environment captured in the unpacking that were not coded in previous steps since their significance had not yet been discovered (e.g., *Out of school—Spring Break*). As this process went along, certain features appeared over and over again and so some of the quotes or summary terms coalesced into new codes. Once this period of systematic observation and notation had been completed for all of the node maps, the notes themselves were examined and organized, producing a series of new codes to be used in subsequent analysis.

Phase 3: Qualitative Sorting

Once all of the node maps had been flagged for salient qualitative features, the primary investigator reviewed all of the node maps again in order to sort them into broad categories based on shared features, both from the flagged notes and from the previously recorded descriptive criteria. Each "pile" of maps was given a working label that changed several times over the course of the sorting process. These labels served as reminders only and were not intended to relate to one another in any meaningful definition of categorical differences, though some of these labels were eventually used to identify emergent pathways. Two examples of such sorting labels were "intentional use" and "negative mood state."

Phase 4: Characterizing Pathways to Relapse

The fourth and final stage of qualitative analysis involved reviewing each of the "piles" generated by the above sorting several times in order to produce meaningful categories of characterization by combining, dividing, and reorganizing those piles formed above. The goal in this process was to ask, "what type of relapse is this," and sort the node maps into meaningful "pathways" based on all of the available criteria, described above, simplified into their highest-order components. This process produced more than a dozen pathways. Each pathway was then defined in terms of its characteristics with regards to salient narrative features. As the pathways were being defined, it became evident that several of them were either too vague or too similar to one another to be reasonably considered distinct pathways, and so they were combined or reordered once again. The final product of this sorting were 11 pathways. Once the pathways were thus defined, each map was reviewed again and compared against the defining criteria for its respective pathway in order to ensure that the characteristic features were not violated. This produced an additional period of resorting, though all 11 pathways were still retained.

RESULTS

Sample Characteristics

The first stage of analysis involved simple descriptive statistics taken from the initial "objective criteria" phases of coding.

Person-related descriptors

The reported age in this sample ranged from 14-20 years, with a mean age of 16.8 years (SD = 1.9 years). One hundred twenty-three (64.1%) of the maps were reported by males and 67 (34.9%) were reported by females. This distribution is similar to the Hope Academy 2018-2019 academic year demographics, which indicates a 60:40 male-to-female ratio in their student body. One hundred seventy-one (89.1%) of the node maps were reported by students who identified as white, while only 21 (10.9%) came from students who did not identify as white. This distribution contains proportionally more white students than the Hope Academy 2018-2019 academic year demographics, which indicates that 64% of their students were white. Out of the 192 node maps used in the final analysis, 42 (21.9%) reported a comorbid psychological disorder.

Disease-related descriptors

Out of 189 node maps analyzed, 166 (86.5%) included reports of substance use or abuse in the student's immediate biological family, 18 (9.4%) reported no substance use in the family, and the remaining 5 (2.6%) were unable to report due to the fact that they were taken from students who did not have contact with their biological parents. The students in this sample reported an age of onset for substance use ranging from 6 to 16 years of age, with a mean age of 12.7 years (SD = 1.7 years). By subtracting the age of onset from the students' reported current age in years, the number of years using substances within this sample ranged from 1 to 11 years, with an average of 4.1 years (SD = 1.9 years). Out of 191 node maps examined, 148 (77.1%) reported prior treatment for SUD.

Episode-related descriptors

Leading up to the incident of use reported, 74 (38.5%) maps reported attending zero recovery/support-group meetings, 51 (26.6%) reported minimal attendance (i.e., fewer than 10 meetings attended overall or else a significant decrease in attendance rate compared to earlier periods of recovery), 23 (12.0%) reported regular (i.e. weekly) attendance, and 44 (22.9%) reported significant (i.e. daily or more than 5 per week) attendance. In the present sample, 157 (81.8%) maps reported not having a sponsor, 22 (11.5%) reported that the student had stopped contacting their sponsor, and 13 (6.8%) reported at least semi-regular (or as-needed) contacts with a dedicated recovery sponsor.

The number of days abstinent up to the current use episode ranged from 0 to 1200 days, with a mean of 88.6 days (SD= 143.1). The modal number of days abstinent was 0 days (25 node maps or 13% of the node maps sampled). The median number of days abstinent was 45 days.

As for the substances used during the episodes reported, 106 (55.2%) reported using cannabis, 56 (29.2%) reported alcohol, 21 (10.9%) reported opioids, 15 (7.8%) reported over-the-counter medications, 10 (5.2%) reported benzodiazepines, 9 (4.7%) reported synthetic cannabinoids, 7 (3.6%) reported hallucinogens, 4 (2.1%) reported cocaine, 3 (1.6%) reported amphetamines, 3 (1.6%) reported some other substance not-otherwise-specified (i.e., "pills"), and 2 (1%) reported inhalants. Out of the above frequencies, 75 (39.1%) reported only using cannabis, 36 (18.8%) maps reported using multiple substances during a single episode, and 32 (16.7%) reported only alcohol. Of the 56 maps that reported using alcohol, 45 reported binge drinking (at least 4 drinks for females or 5 drinks for males; National Institute on Alcohol Abuse and Alcoholism, 2019).

Factors Proximal to Relapse: People, Places, Things

People

The first point of separation was between maps that reported using alone (n= 47, or 24.5%) and those that reported using in the company of others. A chi-square test of independence showed no significance difference between males and females on this separation ($X^2 = 4.81$, $p = 0.68$). There were four main categories that emerged in the "used in the company of others" category: Using with "old using friends" (n= 63, or 32.8%), using with other Hope

Academy students (*n*= 18, or 9.4%), using with a significant other (*n*= 7, or 3.6%), and using with Family (*n*=4, or 2.1%). The remaining relapse events occurring with others (*n*=52, or 27.1%) were coded as "others not-otherwise-specified" because the people reported as being present during the use episode were not clearly identified.

Places

The first point of separation was between maps that reported using at home (*n*= 44, or 22.9%) and those that reported using away from home. Of those that reported using away from home, 58 (30.2%) reported using at a friend's house; 17 (8.9%) reported using in a car; 16 (8.3%) reported using outdoors in a park, field, or patch of woods; 5 (2.6%) reported using at school; 3 (1.6%) reported using at a treatment facility (e.g., Fairbanks); and 2 (1%) reported using at work.

Things

This category was separated into the following subcategories: mood/emotion/affect, cognitions/thought patterns/attitudes/beliefs, and additional things.

Mood/Emotion/Affect. With regards to the emotionality of the use episodes reported in the node maps, 93 (48.4%) reported negative affect directly preceding substance use, 45 (23.4%) reported either no or very limited affect during the period immediately preceding use, and 38 (19.8%) reported positive affect. Furthermore, 59 (30.7%) reported boredom leading up to their substance use.

Cognitions/Thought Patterns/Attitudes/Beliefs. The most common cognitive process reported was thoughts about substance use prior to the actual use. Forty-six maps (24%) reported eager anticipation of substance use, 34 (17.7%) reported a positive inclination towards substance use (even absent explicit intent), 24 (12.5%) reported reluctance to use, 18 (9.4%) reported ambivalence about using, 17 (8.9%) reported anxious anticipation of use, 11 (5.7%) reported their use as necessary or utilitarian for the purpose of self-medicating, 10 (5.2%) reported specific opposition or disinclination towards use, and 8 (4.2%) reported being resigned to the inevitability of use. The remaining 24 (12.5%) maps reported using without any prior consideration or reported attitudes.

A common attitude observed was whether the student was willing to call themselves an "addict." The majority of maps (n= 123, or 64.1%) reported not identifying as an addict (e.g., saying "I am not an addict" or using language inconsistent with being an "addict," such as "I can control using" or "I can quit anytime"), while only 28 maps (14.6%) reported that the student identified as an addict/alcoholic. The remaining 41 (21.4%) were categorized as "unclear/uncertain" because there was insufficient information reported to determine the students' attitude towards themselves.

Additional Things. Twenty-eight maps (14.6%) reported significant interpersonal conflict with a friend, significant other, or family member directly prior to substance use; another 28 (14.6%) reported significantly traumatic negative life events (i.e., parents' divorce, being kicked out of their home, recent death of family member or significant other, etc.) directly prior to use, and 20 (10.4%) reported a state of below-average physical health (i.e., currently sick, interrupted sleep, or recent surgery). Sixty-nine maps (35.9%) reported being out of school/away from Hope Academy at the time of use. Four maps (2.2%) recorded the use episode beginning during a period when the student had run out of or otherwise been without psychotropic medications for a period of days or weeks.

Emergent Patterns: Pathways to Relapse

Node maps were categorized into 11 pathways to relapse based on common thematic elements or motivations towards use evident within the narrative of the reported relapse event. The most salient features of each pathway are reported here; a full report of the demographic and descriptive features of each pathway is shown in Table 1, while Table 2 reports frequencies of the People, Places and Things variables for each pathway.

Pathway 1: Escaping.

Overview. This pathway is characterized by episodes of use that are preceded by a state of significant negative affect and where use is reported as an attempt to "escape" from that mood state and the undesirable circumstances of life.

Demographics. This pathway included 16 node maps, with the following predominant features (see Table 1 for more details): 12 maps from females, mean age = 16.6 years (SD = 1.5

years), Age range 14 to 19 years, and 14 maps from students who identified as white. Twelve reported a positive family history for substance use, 7 reported comorbid psychological disorders, and mean years using was 3.9 years (SD = 1.7 years). Most maps reported attending no meetings (n = 10) and having no recovery sponsor (n = 14), with a mean number of days abstinent of 75.8 days (SD = 80.0 days).

People, Places, and Things. Predominant people, places, and things for this pathway include the following (see Table 2 for more details): 9 maps reported using alone and 10 reported using away from home. Fourteen maps reported negative affect, 7 reported that the student did not identify as an addict, and 9 reported interpersonal conflict prior to use. Seven maps reported the episode occurring while the student was out of school or otherwise away from Hope for a period of time. The most common substance reported was cannabis (n=9).

Narrative Features. The node maps in this pathway included initial denial of the intent to use and either ongoing negative circumstances at home/in life (e.g., financial troubles, homelessness, ongoing conflict) or a specific negative event that produced significant negative emotion (e.g., conflict at school). Negative affect was prevalent and reported throughout the map. Cognitive processes included either a commentary on those negative feelings (e.g., "I hate feeling this way," "this is awful") or a description of the life events related to the negative mood. The instance of substance use occurred after a specific decision to use, often accompanied by thoughts that explicitly indicate a desire to "stop hurting" or "be numb."

Pathway 2: Self-Medicating.

Overview. This pathway is characterized by substance use motivated by the attempt to alleviate a negative condition specifically related to physical health.

Demographics. This pathway included 3 node maps, with the following predominant features (see Table 1 for more details): 2 were from females, mean age = 17.3 years (SD = 0.6 years), Age range 17 to 18 years, and 3 were from students who identify as white. Two reported a positive family history for substance use, 2 reported comorbid psychological disorders, and mean years was 7.3 years (SD = 3.2 years). Maps reported an average of 515.7 days abstinent (SD = 511.4 days).

People, Places, and Things. Predominant people, places, and things for this pathway include the following (see Table 2 for more details): 2 maps reported using at home, 2 reported

significant negative affect, 2 indicated that the student did not identify as an addict, and 3 reported below-average physical health at the use episode. Each of these three maps reported using a different substance.

Narrative Features. This pathway is characterized by an initial state of poor physical or mental health, such as being sick, not sleeping, or experiencing uncontrollable anxiety prior to use. The maps described reasons for use rather than details of the use episode (e.g., "get pills to help sleep," "wanting to sleep"). Few cognitions were reported overall (e.g., "no thoughts," "wasn't thinking," "just tired"). Thoughts reported concerned motivations to use (e.g., "didn't want to use," "just wanted to feel something"). Feelings reported were negative and often included negative physical sensations (e.g., "not good," or "exhausted"). The maps included statements expressing a negative view of recovery (e.g., "don't need meetings," "I can do it on my own," "[using] is not an issue for me") and denials of being an "addict."

Pathway 3: Coping with Tragedy.

Overview. This pathway is characterized by use is in response to a specific event that eclipses everything else in the student's life.

Demographics. This pathway included 5 node maps, with the following predominant features (see Table 1 for more details): 5 were from males, mean age = 16.8 years (SD = 1.9 years), Age range 14 to 19 years, and 5 maps were from students who identify as white. Four reported a positive family history for substance use, and mean years using was 5.2 years (SD = 2.6 years). Four reported having no recovery sponsor, with an average of 176.2 days abstinent (SD = 168.1 days).

People, Places, and Things. The only predominant people, places, and things for this pathway (see Table 2 for more details) was that all 5 reported negative affect. All of these node maps reported using substances with sedative properties, with a roughly equal spread of cannabis, alcohol, opioids, and benzodiazepines.

Narrative Features. This pathway is characterized by a tragic event occurring immediately prior to the use episode (e.g., death of a close family member or significant other, parents' divorce, a break-up, recovery sponsor relapsing and quitting the program). The maps in this pathway focused on this event, including cognitions that the student was unable to tolerate or

control the event and their resulting negative affect. The maps reported seeking out substances to "blot out" their thoughts/feelings and "not feel for a while."

Pathway 4: Critical Mass.

Overview. This pathway is characterized by a load of small stressors that ultimately drive the student beyond their limits of self-command.

Demographics. This pathway included 6 node maps, with the following predominant features (see Table 1 for more details): 3 were from females, mean age = 16.7 years (SD = 0.8 years), Age range from 16 to 18 years, and 6 were from students who identify as white. Five reported a positive family history for substance use, and mean years using was 4.0 years (SD = 2.1 years). Three reported attending 0 recovery meetings, 3 reported having no recovery sponsor, and mean days abstinent was 92 days (SD = 81.7 days). The most common substances used were alcohol and cannabis (3 maps each) and 3 reported using more than one substance.

People, Places, and Things. Predominant people, places, and things for this pathway include the following (see Table 2 for more details): 6 reported using away from home, 3 failed to report any significant affect, and none reported that the student identified as an "addict." Alcohol and cannabis were the primary substances reported.

Narrative Features. This pathway is characterized by a long period of abstinence and no initial intent to use. The maps in this pathway reported ongoing conflict or instability at home, with associated factors, such as feeling unwell physically, being over-worked, a recent lack of sleep, or some other state of mental and emotional stress. The maps described the experience of an additional small or unexpected stressor occurring in addition to those noted above (e.g., failing a test at school, being picked on by classmates, arguing with a significant other) serving as a "final straw" that lead the student to feel defeated. Feelings reported were strongly negative. Thoughts reported were fatalistic in nature (e.g., "f-it," "whatever," "Need a break"), leading to a concession or break in the pattern of recovery (e.g., going to a party where the student knows there will be drugs, skipping school/meetings, or cancelling plans with a sponsor). Thoughts reported did not explicitly express intent to use. Maps reported responding to an opportunity to use by "giving in." Thoughts were characterized by all-or-nothing thinking (e.g., "already going to get caught so might as well"), with initial use leading to larger, binge-like patterns of use.

Pathway 5: Unexpected Activation.

Overview. This pathway is defined by a successful pattern of recovery that is interrupted by an unexpected opportunity to use. Maps in this pathway do not describe any specific action to seek out substance use. The opportunity to use catches the student "off guard" and acts as a trigger that activates old cravings and patterns of substance-related thoughts/behaviors. Students report that they had become isolated prior to use and begun to drift into a "recovery void," such that they were no longer active in their own recovery. The maps tended to report fairly long (several weeks or months) periods of abstinence, that became routine and were a product of a carefully controlled environment, rather than the product of regular effort. The maps described that the opportunity to use came unexpectedly and that the student used alone and in secret.

Demographics. This pathway included 8 node-maps, with the following predominant features (see Table 1 for more details): 6 were from males, mean age = 16.5 years (SD = 0.9 years), Age range 15 to 18 years, and 6 were from students who identify as white. Five reported a positive family history for substance use, 1 reported a comorbid psychological disorder, and mean years using was 3.5 years (SD = 1.6 years). Seven reported having no recovery sponsor, with a mean number of days abstinent of 104.6 days (SD = 84.8 days).

People, Places, and Things. Predominant people, places, and things for this pathway include the following (see Table 2 for more details): 6 reported using alone, 6 reported using at home, and 5 reported identifying as an "addict." Five maps reported the episode occurring while the student was out of school or otherwise away from Hope for a period of time. Cannabis was the most frequent substance reported in these maps, though there was a variety of different substances used and the choice of substance was based more on availability than preference.

Narrative Features. Maps in this pathway are characterized by no reported initial plan to use. Maps reported that the student had begun to taper off regular recovery activity or was otherwise "going through the motions." During these use episodes, an unexpected opportunity to use occurred (e.g., the student finding an old stash of drugs somewhere in their house or discovering other readily accessible drugs that are not closely monitored, such as a parent's pain prescription). These maps then described a period of preparation, in which the student waited for an opportune time to use (e.g., waiting until parents had left the house or gone to sleep). Thoughts were sparsely reported and were not related to using. Affect reported was typically flat or "bored" at the beginning of the map, followed by a period of anxious excitement leading up to

the instance of use, and then a period of regret and self-criticism following use. Maps in this pathway described using alone and in secret and after the fact reported that the use was "not worth it."

Pathway 6: Unexpected Offer.

Overview. Maps in this pathway are similar to the previous pathway in that they are characterized by a breach in the normal routine or system of recovery involving an unanticipated temptation to use that triggers the use episode itself. In these maps, however, the unexpected opportunity to use is presented by another person.

Demographics. This pathway included 22 node maps, with the following predominant features (see Table 1 for more details): 15 were from males, mean age = 17.4 years (SD = 1.4 years), Age range = 14 to 20 years, and 21 were from students who identify as white. Eighteen reported a positive family history for substance use, 4 reported comorbid psychological disorders, and mean years using was 5.3 years (SD = 2.6 years). Thirteen reported attending 0 recovery meetings and 16 reported having no recovery sponsor, with a mean number of days abstinent of 59.2 days (SD = 66.9 days).

People, Places, and Things. Predominant people, places, and things for this pathway include the following (see Table 2 for more details): 8 reported using with an "old using friend" and 18 reported using not at home. Nine maps reported negative affect and 10 failed to report any significant affect. Twelve maps reported that the student did not identify as an addict. Cannabis was the most common substance used in these maps, though there was a variety of other substances as well, and the choice of substance seemed to be based on availability rather than preference.

Narrative Features. Maps in this pathway reported no initial intent to use. The maps described that the student had lapsed into a period of boredom and anhedonia, often corresponding with decreased involvement in recovery activities. The maps reported an encounter with a friend, often an "old using friend," who offered the student the chance to use. The maps reported that the student did not seek out the encounter and that the student offered initial resistance or had some internal debate as they decided how to respond. Feelings described were anxiety and uncertainty. The decision to use was accompanied by thoughts indicating surrender, such as "f-it" or "whatever." After using, the maps reported thoughts related to the

consequences of their actions. Subsequent feelings reported included self-criticism and a negative mood.

Pathway 7: Planned Use.

Overview. In this pathway, substance use occurred because the student deliberately planned to use.

Demographics. This pathway included 19 node maps, with the following predominant features (see Table 1 for more details): 14 were from males, mean age = 16.9 years (SD = 1.4 years), Age range = 14 to 20 years, and 18 were from students who identified as white. Sixteen reported a positive family history for substance use, 1 reported comorbid psychological disorders, and mean years using was 4.0 years (SD = 1.4 years). Seventeen maps reported having no recovery sponsor, with a mean number of days abstinent of 98.3 days (SD = 66.6 days).

People, Places, and Things. Predominant people, places, and things for this pathway include the following (see Table 2 for more details): 18 reported using with others (most commonly with "old using friends"; n=8) and 10 reported using at a friend's house. The affectivity of these maps was mixed. Seventeen maps reported that the student did not identify as an addict. Five maps reported the episode occurring while the student was out of school or otherwise away from Hope for a period of time. Six reported engagement in binge drinking and 7 reported blacking out as a result of substance use. There was a wide range of substances used in these maps, though the two most common were cannabis and alcohol.

Narrative Features. The maps in this pathway are characterized by a specific, explicit intent to use. Often, this intent occurred after a long period of abstinence and after a more recent period during which the student reported to have begun to reminisce about using. The use was reported to be part of a plan laid out ahead of time and generally corresponded with the student being away from school, going on a trip, or some other special occasion. The maps described the thought that a "break" from recovery was deserved. Thoughts included strategies or remarks about avoiding detection. Affect was generally positive and described excited anticipation for use. Other thoughts included reassurances such as, "I know how to handle [using]," and/or rationalization that the use episode does not represent a problematic pattern of behavior (e.g., "I'll quit later, in time for UDS").

Pathway 8: Resistant to Recovery.

Overview. In this pathway, substance use was deliberate, but also characterized by explicit hostility and/or resistance to the recovery process.

Demographics. This pathway included 5 node maps, with the following predominant features (see Table 1 for more details): 3 were from females, mean age = 17.0 years (SD = 1.9 years), Age range 15 to 20 years, and 5 were from students who identify as white. Three reported a positive family history for substance use, and mean years using was 4.2 years (SD = 1.9 years). Three reported minimal attendance at recovery meetings and 4 reported having no recovery sponsor, with a mean number of days abstinent of 73.4 days (SD = 117.8 days).

People, Places, and Things. Predominant people, places, and things for this pathway include the following (see Table 2 for more details): 3 reported using alone and 3 reported using at home. The affectivity of these maps was mixed and 0 identified as an "addict." A variety of substances were used in these maps, with no clear pattern emerging.

Narrative Features. The maps in this pathway describe use that was planned out ahead of time and deliberate. Thoughts reported justified using (e.g., "need to get [use] over with while I'm young," "[using] is no big deal every once in a while," or "everyone goes wild sometimes"). Other thoughts included specific hostility or resistance to the idea of recovery, such as "don't want to be forced," "they just want to control me," "this is all bullsh—."

Pathway 9: Not in Recovery.

Overview. This pathway describes usual or habitual substance use that is not a breach in recovery because no current or past attempt to remain abstinent is reported.

Demographics. This pathway included 22 node-maps, with the following predominant features (see Table 1 for more details): 15 were from females, mean age of 16.9 years (SD = 0.9 years), Age range from 15 to 18, 21 were from students who identify as white. Nineteen reported a positive family history for substance use, 4 reported comorbid psychological disorders, and mean years using was 3.9 years (SD = 1.9 years). Thirteen reported attending 0 meetings and 22 reported having no recovery sponsor, with a mean number of days abstinent of 11.3 days (SD = 42.3 days).

People, Places, and Things. Predominant people, places, and things for this pathway include the following (see Table 2 for more details): 15 reported using with others and using away from home. Eleven reported negative affect; 20 reported not identifying as an "addict." Cannabis was the most common substance used in this pathway.

Narrative Features. The maps in this pathway described activities, including use, with practical but limited details. Use was reported as part of a normal day and not as a significant event. Thoughts and feelings reported described the day's activities and were not specifically related to substance use. No internal resistance or attempts to avoid use were reported and justification was not indicated. Using was described as "just part of life."

Pathway 10: Passive Agency.

Overview. This pathway is characterized by a specific chain of events and/or actions by which the individual places themselves into a situation where they will have the opportunity to use without explicit intent to do so.

Demographics. This pathway included 30 node maps, with the following predominant features (see Table 1 for more details): 18 were from males, mean age = 16.6 years (SD = 0.9 years), Age range = 15 to 18, and 26 were from students who identify as white. Twenty-eight reported a positive family history for substance use, 5 reported comorbid psychological disorders, and mean years using was 3.6 years (SD = 1.8 years). Thirteen reported minimal meeting attendance and 30 reported having no recovery sponsor, with a mean number of days abstinent of 126.1 days (SD = 225.0 days).

People, Places, and Things. Predominant people, places, and things for this pathway include the following (see Table 2 for more details): 30 maps reported using with others and 29 reported using away from home, with the most common location a friend's house (n=14). Eighteen reported negative affect and 28 reported that the student did not identify as an "addict." Nine maps reported the episode occurring while the student was out of school or otherwise away from Hope for a period of time. The majority of these maps reported using cannabis (n=21), though several other substances were reported as well.

Narrative Features. Maps in this pathway reported that the student denied initial intent to use, but that, leading up to the episode, the student tapered off recovery-related activities until they were only minimally involved or else simply "going through the motions." In these maps,

students contacted and met up with old using friends, went to a place where old using friends tend to congregate, or visited a location where they knew drugs would be present. The maps either reported no specific purpose in these actions or provided vague reasons for the actions (e.g., "I can go and not use"). In these maps, students reported that others initiated substance use and that the student showed some initial resistance to using, but eventually agreed to use. Thoughts and feelings were sparsely reported in these maps. Thoughts that were reported tend to be descriptions of a lack of conscious thought, such as "autopilot," "no thoughts," or "on automatic." Feelings reported are generally flat or absent before the use, becoming positive after use. The decision to use was generally accompanied by a thought showing surrender, such as "F-it," "whatever," or "no big deal."

Pathway 11: Acting Out.

Overview. This pathway is characterized by a deliberate act of substance use that the individual uses to spite or punish another, demonstrate personal autonomy, or break rules. In this pathway, using is described as a form of rebellion, a transgressive act performed with the specific intent to be transgressive or to gain control.

Demographics. This pathway included 15 node maps, with the following predominant features (see Table 1 for more details): 11 were from females, mean age of 16.3 years (SD = 1.1 years), Age range = 14 to 18 years, and 13 were from students who identify as white. Fourteen reported a positive family history for substance use, 7 reported comorbid psychological disorders, and mean years using was 4.1 years (SD = 2.2 years). Involvement in recovery programs was mixed and 11 reported having no recovery sponsor, with a mean number of days abstinent of 92.3 days (SD = 127.9 days).

People, Places, and Things. Predominant people, places, and things for this pathway include the following (see Table 2 for more details): 12 reported using with others and 13 reported using away from home. Twelve reported negative affect, 10 reported significant interpersonal conflict proximate to the use episode, and 7 reported a significant negative life event occurring recently. Six reported the episode occurring while the student was out of school or otherwise away from Hope for a period of time. Six reported binge drinking and 8 reported engaging in antisocial behavior during the episode (e.g., stealing, fighting, damage to others'

property). There was no clear pattern to the substances used in this pathway, though the most frequently reported were cannabis and alcohol.

Narrative Features. Maps in this pathway described a denial of intent to use. Maps described an event or situation that marked a turning-point where the student decided to use, commonly an interpersonal conflict (e.g., an argument with a parent or significant other), which produced a state of intense negative mood (e.g., "uncontrollable anger"). The maps described thoughts that a close other exercised authority over the individual (e.g., "[boyfriend] didn't want me to use," "[mom] yelled at me for being late," or "[parent] told me to get out"). The maps described hostile cognitions towards authority, recovery and/or the world (e.g., "F the world", "F you", "No point to any of this"). Additional thought described antisocial or rebellious motives (e.g., "felt good to be bad," "feels good to misbehave") or a deliberate intent to punish another (e.g., "wake up call for mom," "knew it would piss him off"). The use described was often more intense or risky in nature, including use of multiple substances, use of unusual substances (e.g., overdosing on OTC medication, huffing inhalants), and buying from strangers.

DISCUSSION

Through the use of qualitative data sorting and analysis, this study was able to identify a number of factors proximal to relapse among adolescents in recovery from SUD, as well as to use these factors and the features of the narratives reported by these students to categorize the relapse events into 11 emergent pathways. The theoretical foundation for this analysis was in keeping with the principles of root cause analysis, which assumes that an adverse event (in this case, a relapse) is produced by a failure in the system (Riblet et al., 2017). Based on the findings of this study, it can be seen that recovery is a system made up of many interrelated parts, including those related to the individual person in recovery, their thoughts, beliefs, feelings, and emotions; and those related to external factors, their environment, adverse life events, and the actions of other people.

By collapsing the factors studied in this project into three rough categories—those related to cognition, those related to emotion, and those related to external forces acting upon the individual, it is possible to get an idea of how those factors comprise a system of recovery together. Each of the emergent pathways to relapse can then be viewed as failures in one or more parts of this system. By considering the pathways together for their common features, they can each be said to represent one of three critical failures related to those three overarching facets of the system: failure to cope, failure to guard against temptation, and failure of belief. All three of these critical failures in the system will be considered, not only for how they explain each pathway to relapse occurring, but also for how they relate to substance use treatment and recovery program interventions. Identifying these overarching failures in the system is helpful because the failures contain in themselves the seeds of their solution, so by examining them as critical components to a relapse event, it may be possible to gain insight into how to prevent the same type of relapses from occurring in the future.

Failure to Cope

The first system failure that can be observed from these data is a failure to cope with emotional or affective distress. The first three pathways identified by this study are defined by negative affect running out of control: As a result of poor health, tragedy, or simply the common

injuries of daily life, the maps in these pathways report significant negative feelings as the predominant contributing force to the relapse event. On the level of individual factors (People, Places, and Things that were involved in the event), it is possible to identify several of these that could be said to be most heavily implicated in each of the individual node maps. For example, if a student doesn't sleep for several days and then gets drunk to help himself fall asleep, then changing his sleeping patterns might reduce the risk of that kind of relapse event occurring again in the future. Dealing with each relapse event individually, however, fails to capture the big picture issues that can be seen to underlie them when the common pathways to relapse are considered together. The first three pathways share a common theme of negative affect driving a student to use as a maladaptive strategy for dealing with adversity. Thus, they represent not just negative affect, but rather a failure to cope with such affect and adversity.

In order to prevent "failure to cope" relapse events from occurring in the future, some ground may be gained by addressing the individual factors relevant to each circumstance, but the broader area for intervention is to improve coping skills, distress tolerance, and affect regulation. Coping skills and regulation of negative affect should both be addressed here in conjunction with one another. Young people in recovery need to learn new and more adaptive coping strategies to deal with negative life events; they need to have a plan of what to do established ahead of time for when they begin to feel out of control. When they do experience these negative life events, they then need to be able to regulate their own emotional response. Both of these skills are therefore needed. It is the failure of these processes that underlies the negative emotion pathways. Fortunately, both coping skills and affective regulation strategies are regularly taught both at Hope Academy and other substance use treatment facilities around the country, so what is critical for the field now is to increase availability of these facilities. Furthermore, there is good evidence that the ability to cope can be improved by psychotherapy, and that improvements in the ability to regulate negative affect can produce overall reductions in substance use among adolescents (Zapolski & Smith, 2017).

Failure to Guard Against Temptation

The next type of system failure evident in these pathways is the failure to guard against temptation. The Unexpected Activation, Unexpected Offer, and Passive Agent pathways are all typified by this failure. In all three of these pathways, students are subjected to the temptation to

engage in substance use because of external forces that they had not properly guarded against. In order to prevent these types of relapses from occurring in the future, the students' environment must be addressed. In this area, individual factors must be considered with each person to prevent accidental exposure to triggers from occurring, but some commonly occurring types of triggers within these pathways suggest that certain overall measures of safety should be put in place: Ideally, students in recovery need to cut off their access to substance use, so that engaging in a relapse is not even an option for them. Several of the node-maps in Unexpected Activation began with a student accidentally discovering drugs while cleaning his or her room. Others saw the opportunity to use when their doctor prescribed them opioid medication after a surgery, or else they stumbled upon those types of medication left unattended by a parent or other family member. These examples all show that the environment must be carefully controlled in order to give students in recovery their best chance of remaining abstinent. Guarding against temptation, in the Unexpected Activation pathway, means creating an environment that is free from substance use stimuli.

It is important to note that stimuli are just as much of a problem as the opportunities to use themselves, which is why this pathway is called Unexpected Activation, not Unexpected Opportunity. People with SUD can create an opportunity to use if they want to, so as much work as ought to be done to prevent such an opportunity, it is equally important to reduce their exposure to stimuli that might activate old patterns of behavior—what one student in an Unexpected Activation node map referred to as "entering drug mode." This is crucial because as can be seen from the narrative features of this pathway, once the activation occurs, the urge to use tends to take over everything else, suppressing thoughts and feelings until after the student uses, at which point the warnings of conscience return as guilt and self-criticism. It is apparent then, that trying to intervene on a student who has "entered drug mode" may be less productive than preventing the activation of that mindset from occurring in the first place; in other words, guarding against temptation.

While guarding against the onset of a temptation in the first place could be the more straightforward means of preventing these types of relapse events, creating an environment that is entirely free from drug-related stimuli is not always possible. For this reason, it is equally important for students in recovery to have a plan ahead of time for what to do when temptation strikes. Guarding against temptation therefore should be considered as both attempting to prevent

the temptation from occurring in the first place and also designing a plan by which to resist or escape that temptation when it arrives. The details of these sorts of contingency plans will likely vary from person to person in order to reflect their individual circumstances and needs, but an easy example that is encouraged by the program at Hope is that the students should call their sponsor as soon as they feel themselves becoming tempted to use again. Since the relapse events reported in these data do not include any instances of successful resistance to temptation, they do not offer much insight into how and where any particular resistance technique might apply better than another. They do, however, provide many examples of where students experienced unexpected temptations to use, so it is worth returning to some of these in order to better understand how these temptations arise in the first place.

The other two pathways that are characterized by this failure to guard against temptation, the Passive Agent, and the Unexpected Offer, differ from Unexpected Activation in that the environmental stimulus threatening the students' recovery is another person. This introduces an additional complication, because ending old friendships or cutting off contact with others is much more difficult than tossing out pills or locking the liquor cabinet. Ideally, students in recovery would disassociate entirely from their "old using friends," since both existing literature on the subject and their prevalence as a proximal factor within these data show that contact with such friends poses a serious risk to an adolescent's ability to remain abstinent from substance use (Ciesla et al., 2008; Gangi & Darling, 2012). Unexpected Offer and the Passive Agent pathways differ slightly in that the first occurs when students are contacted by someone from this risky social group, whereas the second occurs when the student decides to actively seek out social contact in an environment where substance use may occur.

Both are examples of the failure to guard against temptation, but the Passive Agent is of particular interest in that it involves an active decision made by students to expose themselves to that temptation, and therefore warrants some additional examination. That first step, when a student decides to socialize with people outside of recovery, is critical, and the accompanying narrative features of this pathway give some insight into how this process occurs: When action is taken to enter into that social context, node maps in the Passive Agent pathway report accompanying guilt, anxiety, and nervous anticipation, suggesting that these students know on some level that what they are doing is risky. This resistance is overcome however, by either thought suppression (e.g., "nothing", "not thinking", "autopilot"), or rationalizing (e.g., "not a

big deal", "can go and not use", "don't have to use"), which can be seen through the internal dialogue: The students assure themselves that they can go hang out with those friends and not use. They deny intent to use and report that they were acting out of a desire to be with friends. The primary motivation here is for social interaction, for something to do, for the stimulation of social contact and the relationship with others.

The Passive Agent pathway shows how this desire for social interaction can in itself pose significant risk to sobriety because for those people whose primary social circle involves "old using friends," this desire serves as a motivation *towards* drug use that is not a motivation *for* drug use. In other words, the students are moving closer towards an act of relapse without having to acknowledge that they are doing so, because their desire for social interaction is the primary driver guiding their actions. This is a critical point to emphasize, because that desire for social interaction is not one that can or should be eliminated by intervention, and so this critical failure to guard against temptation is more difficult for students to address because of their ability to compartmentalize motivations.

This is crucial to emphasize, because it highlights an important aspect of recovery: that to be successful, recovery programs cannot just take away, cannot just prohibit; they need to include replacement of the old, problematic reinforcers with new ones (Laudet & Humphreys, 2013). The best way to empower students to guard against temptations from other people then, is to ensure that they have an alternate option for social interaction, and guarding against this type of temptation in particular is necessary, given the fact that social and environmental influences make up the strongest predictor of substance use relapse among adolescents (Anderson et al., 2008; Ciesla et al., 2008; Gangi & Darling, 2012; Ramo & Brown, 2008).

Failure of Belief

The third type of system failure that is evident in these pathways is a failure of belief. The Deliberate Use, Resistant to Recovery, and Not in Recovery pathways are all characterized by a failure of belief: failing to believe that one is an addict, failure to believe that substance use is a problem, failure to believe that recovery can work, failure to believe that sobriety is worth the cost, failure to believe in the consequences of using, failure to believe that life will get better. This failure of belief can be seen throughout these pathways in statements like "it's okay to use

when I'm young, everybody does", "I'm tired of recovery", "They just want to control me", "I miss the feeling", "I just want to feel that way again," and so on.

This is a difficult failure to address with intervention and occasional failures of this kind may be inevitable. To prevent such failures two things are necessary: clear motivation and buy in by the student and consistently working the program. Popular 12-step programs have a saying, "it works if you work it," and it is evident from the node maps in these pathways that relapse often occurs when students have stopped going to meetings, stopped contacting their sponsor—in other words, stopped working the recovery program. Of course, relapse events cannot be attributed to failures of belief if the beliefs are not there to begin with, which is why treatment interventions and recovery programs emphasize the need for buy-in, for those in recovery from SUD to commit to their own recovery.

Individual Factors Proximal to Relapse

By considering these pathways to relapse as evidence of system vulnerabilities rather than failures of the individual, it is possible to look at the overarching areas where the system itself can fail, and to use that insight in order to help prevent those types of failures from occurring again in the future. For this reason, the overall types of system failures common to many relapse events, as described above, are important to consider. It is also worth considering, however, those individual factors proximal to relapse which were used in this study to inform the emergent pathways themselves—the people, places, and things.

People.

The literature has shown that old using friends or others related to a person's past substance-using lifestyle are the most dangerous company to keep for someone attempting recovery (Ciesla et al., 2008). The key of this term of course is in equal parts *using* and *friend*; using around a person who is trying to stay sober puts that person at risk of re-initiation of use, but *friend* is equally important because social influences are both a critical component to successful recovery (Fisher, 2014; Gangi & Darling, 2012), and the greatest risk for relapse events (Anderson et al., 2008; Ciesla et al., 2008; Ramo & Brown, 2008). Resisting the invitations of or, as Hope Academy recommends, completely avoiding association with an old

using friend, is likely difficulty for adolescents. Unsurprisingly, of those node maps that described using with other people, the vast majority of them were accomplished in the company of an "old using friend."

Places.

Overall, most node maps reported using at a place other than at home. However, understanding patterns across use at other locations turned out to be not useful, as it was difficult to deduce specific patterns that are meaningful between, for instance, "hang outs" and "in the car" and "friend's house." Somewhat of a key and meaningful pattern of difference is home vs. not home, but even there, the qualitative perusal of these node maps indicated that most physical places of use are about the situation rather than the place itself, and, in almost all circumstances, the key factor appears to be the other people involved in the use episode. It is certainly true that environmental factors can act as a cue for substance use and so can be intuited to contribute to the overall risk for relapse (as discussed above), but since these locations do not in themselves have a particular innate risk (teenagers for instance, cannot go into bars, which would be an obviously dangerous spot for someone attempting to remain sober) the real distinguishing feature of these environments appears to be the other people present.

Things.

Affect. Overall, negative affect and boredom were the most frequently cited affective experiences prior to a relapse event. Both positive and negative affect have been shown to be significantly implicated in relapse, particularly among adolescents in recovery (Anderson, Ramo, Schulte, Cummins, & Brown, 2007; Starks et al., 2010; Waldron et al., 2005). As compared with adults, adolescents in recovery are more likely to relapse while in a positive affective state (Ramo & Brown, 2008; Ramo et al., 2012), and so although this project was primarily exploratory and data-driven, I had expected that there would be a distinct difference between substance use episodes that were characterized by overwhelmingly positive (as compared to negative) emotional states, hoping that such a difference would inform pathways to relapse between individuals. It was for this reason that the initial coding plan (Appendix B) sought to characterize node maps by positive and negative affect. In reality, the students' reporting of their

affective states prior to the relapse event within these data lacked the clarity and specificity necessary to make that distinction. Nevertheless, positive affect is still evident and relevant in these data and was still considered during the final sorting process. The pure quantitative counting of emotions turned out to be less meaningful than the qualitative patterns observed in how and when emotions present themselves in the reported chain of events related to substance use. These patterns are explored in each of the pathways, and negative affect in particular has been discussed already as a significant contributing factor to many of the relapse events discussed.

Positive emotion was also present in these node maps, but instead of constituting a "positive emotion" pathway in itself, the way that positive affect contributed to the other pathways turned out to be more nuanced. The Passive Agent pathway, for instance, includes frequent reports of positive affect motivating the desire for social contact, and so those emotions are important to this pathway even though they did not represent the overall valence of emotion that defined it. Perhaps the closest thing to a "positive affect" pathway in these data could have been extracted from those pathways describing deliberate use. The Not in Recovery, Deliberate Use, and Resistant to Recovery pathways included a significant amount of positive affect related to substance use, but since this did not seem to be particularly indicative of the underlying problem that led to these relapses, positive affect was not judged to constitute a major thematic element.

Other things. There were a huge number of additional factors, the majority of which are not reported in this study. While these additional factors are certainly informative to individual cases, they did not appear often enough to create a meaningful pattern. Furthermore, most of the factors that were discovered often enough to be considered significant are best viewed in light of the narrative elements to the node maps, and so are described as components to one or more of the relapse pathways. Nevertheless, some factors did emerge that were widespread enough to be meaningful on their own. The most salient of these were: (1) Interpersonal conflict, (2) health/physical factors, (3) traumatic or significant life events, and (4) conflict/instability of living situation.

Study Limitations

The findings of this study should be considered with the following limitations: In the first place, all of the above analyses were carried out *post hoc*. Because the node maps were only completed when a relapse event occurred, it is impossible to draw conclusions about the predictive nature of any of the factors to increase or decrease the probability of eventual use. All of the data used in this analyses related to an instance of use; and so making judgments about the events and decisions that preceded this use is biased by the inevitable outcome, since no meaningful comparison can be made to instances where the same events and decisions were present but no instance of substance use followed. This means that, while the findings of this study contribute a more detailed look at the process of thoughts and events surrounding an instance of substance use, they do not allow for any prediction or comparisons based on those factors.

Furthermore, the data in this sample are de-identified node maps selected randomly from those generated over several years at Hope Academy. The random selection means that a certain number of the maps in this sample may relate to the same student. Since the data are deidentified, there is no way to judge definitively whether or not the 200 maps samples represent 200 different students or whether there are several included from the same students. This means that the sample data are potentially dependent, and therefore quantitative statistical tests are not applicable since their intrinsic assumption of independence may be violated.

Another significant source of limitation for this study was the nature of the data themselves. The information included in the unpacking process was different between node maps. This difference can be attributed to a number of factors. It must be remembered that the purpose of unpacking is to provide an opportunity for reflection for the students at Hope Academy. It is, therefore, an instructional and therapeutic process, not one designed to generate data for research. For the purposes of its use at Hope Academy, the process itself is more valuable than the product, so the course of the unpacking was tailored to the needs of each student. Some accounts may have focused more or less on any one area of the use episode, and these differences are evident in the maps themselves. Furthermore, these maps were generated across several years and by several different recovery coaches, and while the “unpacking” process was well standardized across recovery coaches, student engagement with the process was not. Neither was the peripheral notation added to the maps during the final reflection which

students were invited to engage in after the events of the unpacking were fully reported. Whether or not these details were present, and what type of details were presented, was different for each node map. For an example of how the data present on a node map, see Appendix A.

Even apart from limitations in the quality of the sample data, this study is also limited by the nature and specificity of its sample. The sample contains proportionally more white students than the general demographics of Hope Academy, which itself has proportionally more white students than the general population. These characteristics, while making them a fascinating case study, are not necessarily representative of the larger population of adolescents with substance use disorders.

Finally, the findings of this study are limited by the fact that the qualitative sorting process was entirely carried out by one investigator. Since this process necessarily involved a certain degree of subjective judgment, particularly with regards to defining the emergent pathways, it is likely that some different and perhaps better conclusions could be drawn from these same data and methods. Additionally, the results presented in this study represent the final product of the coding process, whereas the interpretation of these data did not occur until after the fact. This is particularly relevant to the emergent pathways themselves, because they are a product of the qualitative sorting process and not of theoretical interpretation. They are interpreted in this discussion with regards to the overarching system vulnerabilities which they represent, but initially defined only by the general question of "what kind of relapse is this?" without considering the broader implications therein. The first three pathways, all defined by negative affect, for instance, largely come together in the discussion since they share a similar narrative and represent the same failure of system. They are separate in the results because they were separated during sorting. Since much of the present study was exploratory and data-driven instead of driven by *a priori* hypotheses, a good deal of the insights gained did not appear until the end. If I were to approach these same data again, given what I know now, my data sorting process would likely be different, but to say that is to say nothing, since it defeats the purpose of exploratory research entirely.

CONCLUSION

This study represents a significant step in a program of research aimed to better understand the factors proximal to substance use relapse among adolescents in recovery from

SUD. Although a number of previous studies have examined factors relating to relapse events in similar populations (e.g., Anderson, Frissell, & Brown, 2007; Kristen, Danielle, & Sandra, 2006; Gonzales, Anglin, Beattie, Ong, & Glik, 2012), this study has the advantage of incorporating behavioral chain-analysis data, which provide additional insight into the events, thoughts, and feelings that occur directly before instances of substance use. By examining not only the individual contributing factors relevant to each relapse event, but also the structure of the narratives reported by the students themselves, this study allows for additional insight to be gained that will hopefully be informative for recovery and SUD treatment programs to prevent the types of relapse events described in this study from occurring again in the future.

Overall, the most important failures in the system leading to relapse were failures to cope, failures to guard against temptation, and failures of belief. Although many treatments are designed to address these failures before they occur, there are important limitations in their effectiveness that make them far from foolproof. Although strategies to avoid such failures can be applied broadly in clinical groups, it may also be key to apply personalized strategies for adolescents who struggle in one of these areas or another. Thus, by matching the treatment to the needs of the individual may increase the likelihood of maintained sobriety. It may be useful to assess for typical failures of the system in order to best design and implement effective treatments.

Table 1. Frequency of demographic variables by emergent pathway

			Demographics										Recovery Involvement							
			Age	Sex		Race		Family History SUD			Yrs using	Psych	Meetings				Sponsor			Days abstinent
Path #	Path Name	*n*	M (SD)	F	M	W	NW	Pos	Neg	Unkn.	M (SD)	n (%)	None	Min.	Reg.	Sig.	None	No Contact	Contact	M (SD)
1	Escaping	16	16.6 (1.5)	4 (25.0)	12 (75.0)	14 (87.5)	2 (12.5)	12 (75.0)	2 (12.5)	2 (12.5)	3.9 (1.7)	7 (43.8)	10 (62.5)	4 (25.0)	0 (0.0)	2 (12.5)	14 (87.5)	1 (6.3)	1 (6.3)	75.8 (80.0)
2	Self-Medicating	3	17.3 (0.6)	2 (66.7)	1 (33.3)	3 (100)	0 (0.0)	2 (66.7)	1 (33.3)	0 (0.0)	7.3 (3.2)	2 (66.7)	0 (0.0)	1 (33.3)	1 (33.3)	1 (33.3)	2 (66.7)	0 (0.0)	1 (33.3)	515.7 (511.4)
3	Coping	5	16.8 (1.9)	5 (100)	0 (0.0)	5 (100)	0 (0.0)	4 (80.0)	1 (20.0)	0 (0.0)	5.2 (2.6)	5 (100)	1 (20.0)	2 (40.0)	1 (20.0)	1 (20.0)	4 (80.0)	1 (20.0)	0 (0.0)	176.2 (168.1)
4	Critical Mass	6	16.7 (0.8)	3 (50.0)	3 (50.0)	6 (100)	0 (0.0)	5 (83.3)	0 (0.0)	1 (16.7)	4.0 (2.1)	6 (100)	3 (50.0)	1 (16.7)	1 (16.7)	1 (16.7)	3 (50.0)	2 (33.3)	1 (16.7)	92.0 (81.7)
5	Unexpected Activation	8	16.5 (0.9)	2 (25.0)	6 (75.0)	6 (75.0)	2 (25.0)	5 (62.5)	3 (37.5)	0 (0.0)	3.5 (1.6)	1 (12.5)	2 (25.0)	1 (12.5)	3 (37.5)	2 (25.0)	7 (87.5)	1 (12.5)	0 (0.0)	104.6 (84.8)
6	Unexpected Offer	22	17.4 (1.4)	7 (31.8)	15 (68.2)	21 (95.5)	1 (4.5)	18 (81.8)	4 (18.2)	0 (0.0)	5.3 (2.6)	4 (18.2)	13 (59.1)	2 (9.1)	4 (18.2)	3 (13.6)	16 (72.7)	4 (18.2)	2 (9.1)	59.2 (66.9)
7	Deliberate Use	19	16.9 (1.4)	5 (26.3)	14 (73.7)	18 (94.7)	1 (5.3)	16 (84.2)	1 (5.3)	2 (10.5)	4.0 (1.4)	1 (5.3)	5 (26.3)	4 (21.1)	1 (5.3)	9 (47.4)	17 (89.5)	1 (5.3)	1 (5.3)	98.3 (66.6)
8	Resistant to Recovery	5	17.0 (1.9)	3 (60.0)	2 (40.0)	5 (100)	0 (0.0)	3 (60.0)	2 (40.0)	0 (0.0)	4.2 (1.9)	5 (100)	0 (0.0)	3 (60.0)	2 (40.0)	0 (0.0)	4 (80.0)	0 (0.0)	1 (20.0)	73.4 (117.8)
9	Not in Recovery	22	16.9 (0.9)	15 (68.2)	5 (22.7)	21 (95.5)	1 (4.5)	19 (86.4)	2 (9.1)	1 (4.5)	3.9 (1.9)	4 (18.2)	13 (59.1)	6 (27.3)	1 (4.5)	2 (9.1)	22 (100)	0 (0.0)	0 (0.0)	11.3 (42.3)
10	Passive Agency	30	16.6 (0.9)	12 (40.0)	18 (60.0)	26 (86.7)	4 (13.3)	28 (93.3)	2 (6.7)	0 (0.0)	3.6 (1.8)	5 (16.7)	7 (23.3)	13 (43.3)	3 (10.0)	7 (23.3)	30 (100)	0 (0.0)	0 (0.0)	126.1 (224.6)
11	Acting Out	15	16.3 (1.1)	11 (73.3)	4 (26.7)	13 (86.7)	2 (13.3)	14 (93.3)	0 (0.0)	1 (6.7)	4.1 (2.2)	7 (46.7)	5 (33.3)	4 (26.7)	0 (0.0)	6 (40.0)	11 (73.3)	3 (20.0)	1 (6.7)	92.3 (127.9)

Note. Frequency of demographic and recovery-related variables of interest for each pathway (Path). Age, Years Using (Yrs using), and Days abstinent are shown as Mean (Standard Deviation). All other variables are shown as *n* (%). Sex is shown as male (M) and female (F). Race is separated into white (W) and non-white (NW). Family history for substance use is shown as positive (Pos), negative (Neg), and unknown (Unkn.). Psych = presence of co-occurring psychological disorder. Meetings = degree of participation in weekly recovery support meetings, shown as none, minimal (Min.), regular (Reg.) or significant (Sig.).

Table 2. Frequency of episode-related variables by emergent pathway

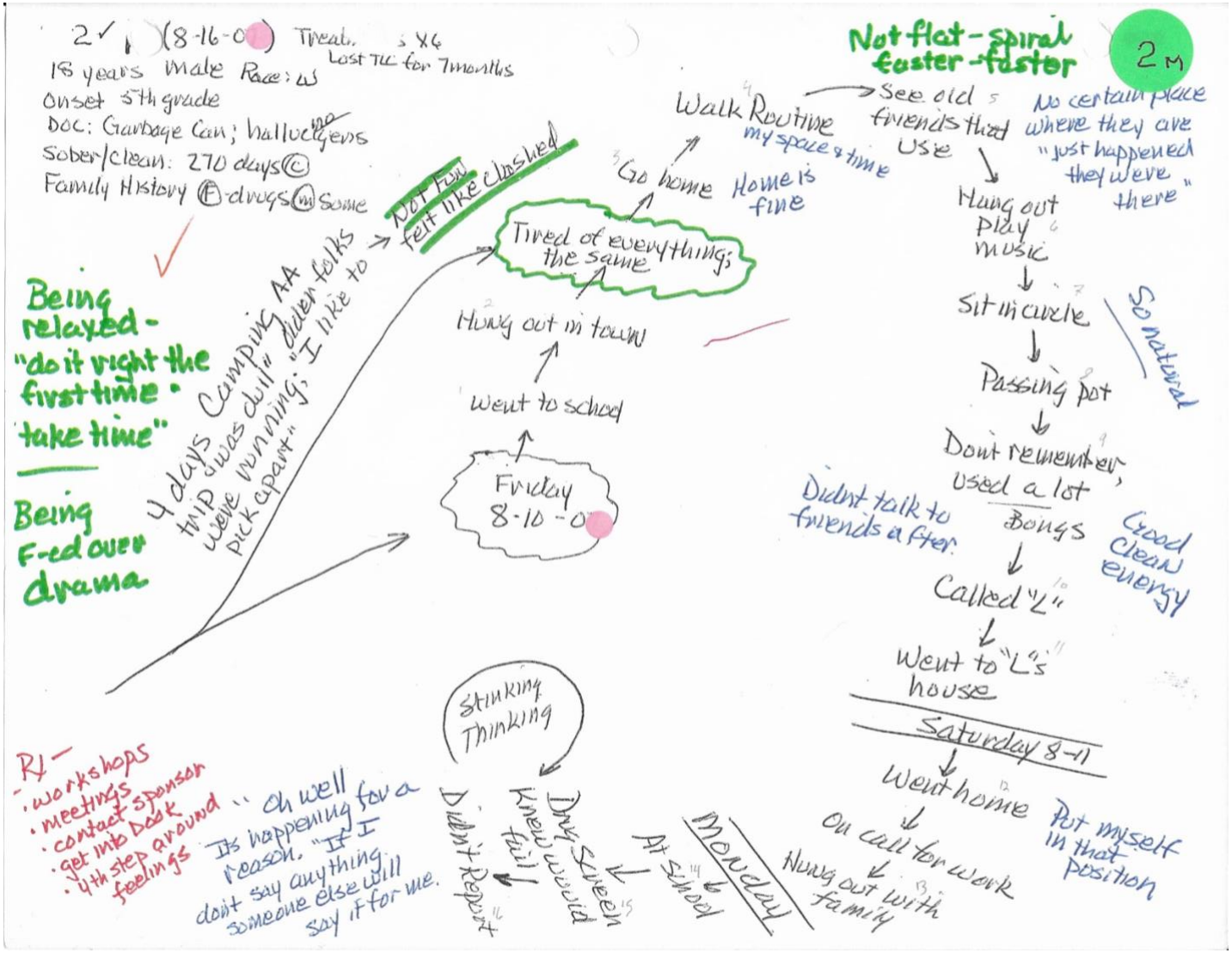
			People, Places, and Things											
			People		Places		Addict			Affect				Substances Used
Path #	Path Name	n	Alone	Others	Home	Out	Yes	No	Uncertain	Flat	Mixed	Pos	Neg	n (%)
1	Escaping	16	9 (56.3)	NOS – 4 (25.0) OUF – 1 (6.3) SO – 1 (6.3) HP – 1 (6.3)	6 (37.5)	Friend's – 4 (25.0) Park – 3 (18.8) NOS – 2 (12.5) Car – 1 (6.3)	2 (12.5)	7 (43.8)	7 (43.8)	1 (6.3)	1 (6.3)	0 (0.0)	14 (87.5)	Cannabis – 9 (56.3) EtOH – 4 (25.0) OTC – 3 (18.8) Halluc – 1 (6.3) Benzo – 1 (6.3)
2	Self-Medicating	3	1 (33.3)	OUF – 1 (33.3) NOS – 1 (33.3)	2 (66.7)	Friend's – 1 (33.3)	0 (0.0)	2 (66.7)	1 (33.3)	1 (33.3)	0 (0.0)	0 (0.0)	2 (66.7)	Cannabis – 1 (33.3) Opioid – 1 (33.3) "Pills" – 1 (33.3)
3	Coping	5	2 (40.0)	OUF – 2 (40.0) NOS – 1 (20.0)	1 (20.0)	Park – 2 (40.0) Friend's – 1 (20.0)	1 (20.0)	2 (40.0)	2 (40.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (100)	Cannabis – 3 (60.0) EtOH – 2 (40.0) Opioid – 2 (40.0) Benzo – 2 (40.0)
4	Critical Mass	6	1 (16.7)	OUF – 4 (66.7) HP – 1 (16.7)	0 (0.0)	Friend's – 2 (33.3) NOS – 2 (33.3) TxF – 1 (16.7) Town – 1 (16.7)	0 (0.0)	3 (50.0)	3 (50.0)	3 (50.0)	0 (0.0)	2 (33.3)	1 (16.7)	EtOH – 3 (50.0) Cannabis – 3 (50.0) Cocaine – 1 (16.7) Halluc – 1 (16.7) Benzo – 1 (16.7)
5	Unexpected Activation	8	6 (75.0)	OUF – 1 (12.5) NOS – 1 (12.5)	6 (75.0)	Work – 1 (12.5) NOS – 1 (12.5)	5 (62.5)	1 (12.5)	2 (25.0)	6 (75.0)	0 (0.0)	2 (25.0)	0 (0.0)	Cannabis – 4 (50.0) EtOH – 2 (25.0) Cocaine – 1 (12.5) Benzo – 1 (12.5) Amphet – 1 (12.5) OTC – 1 (12.5)
6	Unexpected Offer	22	6 (27.3)	OUF – 8 (36.4) NOS – 6 (27.3) SO – 1 (4.5) HP – 1 (4.5)	4 (18.2)	Friend's – 5 (22.7) Car – 4 (18.2) NOS – 4 (18.2) Park – 2 (9.1) Event – 1 (4.5) Work – 1 (4.5)	4 (18.2)	12 (54.5)	6 (27.3)	10 (45.5)	0 (0.0)	3 (13.6)	9 (40.9)	Cannabis – 13 (59.1) Opioid – 5 (22.7) EtOH – 4 (18.2) Synth – 2 (9.1) Benzo – 1 (4.5)
7	Deliberate Use	19	1 (5.3)	OUF – 8 (42.1) HP – 4 (21.1) NOS – 4 (21.1) SO – 1 (5.3) Family – 1 (5.3)	2 (10.5)	Friend's – 10 (52.6) Car – 3 (15.8) School – 1 (5.3) Park – 1 (5.3) Event – 1 (5.3)	2 (10.5)	17 (89.5)	0 (0.0)	2 (10.5)	4 (21.1)	5 (26.3)	8 (42.1)	Cannabis – 11 (57.9) EtOH – 6 (31.6) Opioid – 2 (10.5) Cocaine – 1 (5.3) Benzo – 1 (5.3) Synth – 1 (5.3) "Pills" – 1 (5.3)

Table 2, continued

8	Resistant to Recovery	5	3 (60.0)	OUF – 1 (20.0) Family – 1 (20.0)	3 (60.0)	Park – 1 (20.0) NOS – 1 (20.0)	0 (0.0)	5 (100)	0 (0.0)	1 (20.0)	0 (0.0)	2 (40.0)	2 (40.0)	EtOH – 2 (40.0) Cannabis – 2 (40.0) Synth – 2 (40.0) Cocaine – 1 (20.0) Halluc – 1 (20.0) Benzo – 1 (20.0) Amphet – 1 (20.0) OTC – 1 (20.0)
9	Not in Recovery	22	7 (31.8)	OUF – 6 (27.3) NOS – 6 (27.3) HP – 2 (9.1) SO – 1 (4.5)	7 (31.8)	Friend's – 6 (27.3) NOS – 4 (18.2) Park – 2 (9.1) School – 1 (4.5) Car – 1 (4.5) TxF – 1 (4.5)	1 (4.5)	20 (90.9)	1 (4.5)	2 (9.1)	2 (9.1)	7 (31.8)	11 (50.0)	Cannabis – 15 (68.2) EtOH – 5 (22.7) OTC – 3 (13.6) Opioid – 1 (4.5) Halluc – 1 (4.5) Amphet – 1 (4.5) Inhale – 1 (4.5) "Pills" – 1 (4.5)
10	Passive Agency	30	0 (0.0)	OUF – 18 (60.0) NOS – 10 (33.3) HP – 2 (6.7)	1 (3.3)	Friend's – 14 (46.7) NOS – 10 (33.3) Car – 2 (6.7) Park – 1 (3.3) TxF – 1 (3.3) Town – 1 (3.3)	1 (3.3)	28 (93.3)	1 (3.3)	2 (6.7)	3 (10.0)	7 (23.3)	18 (60.0)	Cannabis – 21 (70.0) EtOH – 9 (30.0) Opioid – 2 (6.7) Halluc – 2 (6.7) Synth – 1 (3.3)
11	Acting Out	15	3 (20.0)	OUF – 4 (26.7) HP – 3 (20.0) NOS – 3 (20.0) SO – 2 (13.3)	2 (13.3)	Friend's – 4 (26.7) NOS – 4 (26.7) School – 1 (6.7) Car – 1 (6.7) Event – 1 (6.7) Park – 1 (6.7)	4 (26.7)	5 (33.3)	6 (40.0)	2 (13.3)	0 (0.0)	1 (6.7)	12 (80.0)	EtOH – 7 (46.7) Cannabis – 6 (40.0) Opioid – 4 (26.7) Benzo – 1 (6.7) Synth – 1 (6.7) Inhale – 1 (6.7)

Note. Frequency of use episode-related variables (People, Places, and Things) for each pathway (Path). All variables are shown as *n* (%). People = who is present during use, separated as Alone or with others (Others); OUF = old using friends, HP = hope peers, SO = significant other, NOS = others not-otherwise-specified. Places = place where substance use took place, separated as Home or away from home (Out); Friend's = friend's house, TxF = treatment facility, NOS = somewhere away from home not-otherwise-specified. EtOH = alcohol, Benzo = benzodiazepines, Synth = synthetic cannabis, Inhale = inhalant, Halluc = hallucinogen, Amphet = amphetamines, OTC = over-the-counter medication, "Pills" = medication tablets not-otherwise-specified.

APPENDIX A


2 ✓ (8-16-0) Treat. 5 X 6
Lost TLC for 7 months
18 years Male Race: W
Onset 5th grade
DOC: Garbage Can; Hallucinogens
Sober/clean: 270 days ©
Family History (F)-drugs (M) Some
Not flat - spiral faster - faster
2 M
Walk Routine
my space & time
See old friends that Use
No certain place where they are "just happened they were there"
Go home
Home is fine
Hung out play music
Sit in circle
So natural
Passing pot
Don't remember, used a lot
Didn't talk to friends after
Bongs
Good clean energy
Called "L"
Went to "L's" house
Saturday 8-11
Went home
Put myself in that position
On call for work
Hung out with family
Monday
At school
Drug screen
Knew would fail
Didn't Report
Stinking Thinking
Oh well
It's happening for a reason. "If I don't say anything someone else will say it for me."
Rx -
- workshops
- meetings
- contact sponsor
- get into book
- 4th step around feelings
Being relaxed - "do it right the first time - take time"
Being F-ed over drama
4 days Camping AA
trip (was dull "older folks
were running; "I like to
pick apart"
Not fun felt like clashed
Tired of everything; the same
Hung out in town
Went to school
Friday 8-10-0

APPENDIX B

1.1 – ***Objective Descriptors:***

Code each node-map for the following variables

1.1.1 - *Study-relevant information*

- ID: Participant ID number
- Coder: 1st Coder initials
- Checked by: 2nd Coder initials

1.1.2 - *Participant demographic descriptors*

- Age: Participant age in years
- Year in school: "Grade"
- Sex: "Female" 1 = Female, 0 = Male
- Race:
    - 1 – White/Caucasian
    - 2 – Black/African American
    - 3 – Asian
    - 4 – South Asian/Indian
    - 5 – Arab/Middle-Eastern
    - 6 – Native American/Alaskan Native
    - 7 – Multiracial
- Ethnicity: "Hispanic" 1 = Yes, 0 = No

1.1.3 - *Disease-specific descriptors*

- Onset: Participant age of SUD symptom onset in years
- Drug of choice: "DOC"
    - 1 – Alcohol
    - 2 – Cannabis
    - 3 – Opioids
    - 4 – Stimulants
    - 5 – Hallucinogens
    - 6 – Benzodiazepines
    - 7 – Club Drugs
    - 8 – Synthetic Drugs
    - 9 – Inhalants

10 – Other/Poly

- Drug used most often: “DUMO”
  - 1 – Alcohol
  - 2 – Cannabis
  - 3 – Opioids
  - 4 – Stimulants
  - 5 – Hallucinogens
  - 6 – Benzodiazepines
  - 7 – Club Drugs
  - 8 – Synthetic Drugs
  - 9 – Inhalants
  - 10 – Other/Poly
- SUD treatment history: “Tx_SUD” code with number of times a particular venue was used as the first number after the decimal (E.G. 3 visits to outpatient = “3.3”)
  - 1 – Education
  - 2 – Addictions counseling
  - 3 – Outpatient
  - 4 – Intensive outpatient
  - 5 – Partial hospitalization
  - 6 – Detox
  - 7 – Inpatient
  - 8 – Residential (long term)
  - 9 – Residential-specialty
- Mental health treatment history: “Tx_Psy”
  - 1 – Emergency services or placement
  - 2 – Counseling
  - 3 – Outpatient
  - 4 – Intensive outpatient
  - 5 – Partial hospitalization
  - 6 – Inpatient
  - 7 – Residential
  - 8 – Residential (long term)

9 – Residential-specialty

- Days abstinent: “Days”
- Involvement in CJS: “CJS”
  0 – None

  1 – Charges/hearing pending

  2 – On probation

  3 – Off probation

  4 – Other active status (Enter as string variable; e.g., “House arrest”)

- Family history of SUD: “Family_Hx”
  0 – Negative

  1 – Positive (birth mother/father SUD; enter as string variable)

  2 – Multiple family members SUD (enter as string variable)

- Meetings attended per week: “Meetings”
- Sponsor: 1 = Yes, 2 = No
- Sponsor contacts per week: “Contacts”

1.1.4 - *Event-specific descriptors*

- Substance used: “SU”
  1 – Alcohol

  2 – Cannabis

  3 – Opioids

  4 – Stimulants

  5 – Hallucinogens

  6 – Benzodiazepines

  7 – Club Drugs

  8 – Synthetic Drugs

  9 – Inhalants

  10 – Other/Poly

- Day of the week: Mon = 1, etc.
- Time of day: Code in 24-hour format
- People: Who the event occurred with
  1 – Alone

  2 – Family members

  3 – Significant other

  4 – Old using friends

5 – School peers

6 – Friends

7 – Acquaintances

8 – Strangers

9 – Other (specify; enter as string variable)

- Places: Where the event occurred

1 – Home

2 – School

3 – Car

4 – Friend's house

5 – Hang out (specify; enter as string variable)

6 – Retail store

7 – Work

8 – Other (specify; enter as string variable)

1.2 – *Affectivity:*

- Affective pattern: Code for prevalent affect of substance use event

1 – Positive

2 – Negative

3 – Mixed

- Total valence: "ValTotal" Sum of all valence scores in 1.2.1
- Total arousal: "ArTotal" Sum of all arousal scores in 1.2.1

1.2.1 – *Node-level affective expression:*

Code each "feeling" (COLOR) node which occurs before and during the substance use event; do NOT code consequences (i.e., nodes which follow the event).

- Term used: "Feeling" Enter each descriptive term as a string variable
- Mean valence rating: "mVal" Enter valence rating from master list
- Mean arousal rating: "mAr" Enter arousal rating from master list

APPENDIX C

Data cleaning:

- Deleted n0096 – recalled 30 days after use.
- Deleted n0029 - it was an exact copy of n0027
- Deleted n0129 – it was an exact copy of n0126
- Deleted n0175 – exact copy of n0113
- Deleted n0103 – no unpacking; no data
- Deleted n0084 – student didn't complete unpacking
- Deleted n0102 – fragmented, nonlinear, overly distant recall, nonspecific to a time/place/date
- Deleted n0159 – no substance use, different topic
- No 137 in binder
- 143A in binder = n0143
- 143B in binder = n0137
- Deleted Hispanic variable – none reported in sample
- Recoded Race variable into White (0/1) because data only report W/NW
- Created FHPSU variable for family hx SUD; coded No/Yes/Unknown + individual yes/no variables for Mom/Dad/Sib (unknown = no)
- Deleted Family_hx variable (detailed string); details not needed now; still in excel
- Created Psych variable for co-occurring psych disorders; entered as string
- Deleted CJS variable – too many missing; vague; not important data
- Deleted DOC variable – too broad to be useful; often missing
- Deleted some Tx categories – none reported in sample
- Deleted Psy Tx Hx variable – too rarely reported to be useful
- Created UseYrs variable as number of years using by subtracting Onset from Age
- Recoded Meetings variable to reflect degree of involvement instead of weekly number; scored none/minimal/regular/significant to still cover more vague reporting
- Recoded Sponsor variable to no sponsor/no contact/contact (more data); none reported is coded no sponsor (0).
- Deleted Contacts variable – specific numbers not reported in sample
- Deleted ToD variable – too many missing; overly vague; not useful info across days
- Recoded DoW as specific day use began; scored 1-7 to replace string
- Deleted PosTotal, NegTotal, ArTotal variables due to method problems: calculated inconsistently (before/during/total) across maps; based on coder interpretation; not meaningful
- Deleted Affect_OA – based on Pos/NegTotals
- Retained AffCount, CogCount – interesting even though Ps can't distinguish Aff/Cog
- Switched ID naming scheme to "0001" etc.
- Recoded weird unpackings to begin w/ "9" – so easier to locate/exclude for analysis
- Recoded TxHx and SU into separate variables; scored yes/no (1/0) to get rid of string variables

- Created Tx_SUD variable as a yes/no variable for hx of tx
- Cleaned up missing data + recoded 99s into blank (SysMiss)
- Clarified drug categories + recoded SU accurately
- Recoded cough syrups + OTC meds as OTC meds (not opioids or hallucinogens)
- Recoded Rx abuse to include deliberate OD of OTC/Rx meds; not opioids/benzos unless tampered with
- Recoded SU_4 as "cocaine" instead of all stimulants
- Recoded SU_7 as "Amphetamines" instead of "club drugs" (only 1 reported was MDMA)
- Recoded SU_other string as SU_text + specified hallucinogens/synthetics/inhalants
- Added SU_11 for "other substance" so can still count those in frequencies
- Combined OC_sex and OC_injured into OC_vict
- Created DaysUsing variable for number of days spanned by use episode

Unusual maps:

- n9009 – feels like rex relapse, not legally: did not inhale; UDS neg: example of success
- n9067 – accidental use; not a relapse in Rec, but relapse for school/legal: good warning
- n9109 – not a relapse; used as prescribed: still sneaky/should have reported
- n9107 – accidental use; not a relapse in Rec, but relapse for school/legal: good warning
- n9137 – not a relapse; used as prescribed: still sneaky/acted guilty
- n9187 – no use, close call: useful example of success
- n9160 – no use, "protection unpacking," close call: useful example of success
- n9169 – denies use; got suspended + unpacking for circumstances: good warning

Notes:

- A "party" is coded if explicitly identified in report or as a large social gathering beyond immediate friends
- Vyvanse, MDMA count as amphetamines for the purposes of this study

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